

Information Displays, Inc.

**333 North Bedford Road
Mount Kisco, New York 10549**

IDIOM #

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INFORMATION DISPLAYS,

Mount Kisco
(914) 241-1000

MR. T. H. NELSON
THE NELSON ORGANIZATION
458 WEST 20th STREET
NEW YORK, NEW YORK 10011

POSTMASTER:

This parcel may be opened for postal inspection if necessary. Return to sender.

INFORMATION DISPLAYS, INC.



23 July 1971

333 N. Bedford Rd.
Mount Kisco, New York 10549
(914) 241-1000 TWX 710-571-2179

Mr. T. H. Nelson
The Nelson Organization
458 West 20th Street
New York, New York 10011

Dear Ted:

It was certainly delightful speaking with you again on the telephone today (7/23/71), and as promised, attached to this letter is a complete new brochure describing our new IDIgraf terminal, as well as a new IDIOM/II technical description and a copy of our Data Sheet No. 217-1170, describing the programming of special characters for the CRISPLINE Character Generator. In addition to this, we also have our Data Sheet No. 237-671, which is a description of our new CRISPLINE Character Generator Programmable Character Set. We especially want to call your attention to the fact that we are not standing still, but are continually developing hardware which will hopefully keep pace with the needs of the future and the display requirements of people like yourself.

IDIgraf will be demonstrative sometime in September. It will not have a color tube in it but, nevertheless, if you would like to see this new and remarkable terminal, please do not hesitate to contact me at the address of this letterhead and make arrangements accordingly. I'm sure Carl Machover would also be equally delighted to see you again.

I await your early response.

Very truly yours,

INFORMATION DISPLAYS, INC.

L. M. Green
Eastern Regional Manager

LMG:trs

Enc: Data Sheets #244, #197
#217, #237, #13-471-11
#13-571-12

cc: Carl Machover



IDIOM/II
TECHNICAL DESCRIPTION

IDIOM/II....Information Displays, Inc. Input/Output Machine....is a fully buffered graphic CRT Console for people-language man-machine dialog. The IDIOM/II can be used for computer-aided drafting and design, computer-assisted instruction, simulation, on-line process control, management information, command and control, information retrieval, human factor studies and medical research.

IDIOM/II is the most recent version of IDI's field proven interactive computer graphics systems. IDIOM/II can display typically three times more data than any previously available IDI display....making IDIOM/II one of the most advanced computer graphics systems available.

Specifications subject to change without notice.

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FIGURE 1

FIGURE 2

1. IDIIOM/II SYSTEM

IDIIOM/II is designed as a cost-effective solution to the problem of interactive graphics. IDIIOM/II represents an optimum combination of cost and performance and will prove to be the best solution to the interactive graphic requirements in the vast majority of cases.

IDIIOM/II was designed with the programmer in mind. Unique features are included in the word organization that make programming simpler. For example, the index register and its associated control allows 1000 successive points to be plotted across the screen with a single instruction, using only two words in memory. Dynamic motion can be implemented in the same way.

IDIIOM/II represents a knowledgeable trade-off between hardware and software. In the process of designing the system, IDI studied several hundred applications in which its earlier display systems had been used. This study was performed in order to decide which functions might best be done in hardware (such as, character generation, line generation, etc.) and which functions might best be done in software (light pen tracking and 3-D rotation). IDI then developed the software programs to complement the hardware functions. However, the hardware was made sufficiently flexible so that if the particular user has specific or unusual requirements, the hardware does not limit him in implementing his own programs. The user can incorporate the software in his operating systems, or, if he wants to make different use of the hardware, he can rewrite the software to reflect his own design factors.

IDIIOM/II is a complete interactive graphic display system composed of three basic sections: the Display Processor, the Display Generator, and the Display Console(s). See simplified block diagram, Figure 1.

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FIGURE 1	
FIGURE 2	

IDIIOM/II is IDI's newest "intelligent terminal"....a system whose advantages include:

High Density Presentations. About 6600 characters, or 5500 short line segments, or 15,000 inches of long line segments can be displayed flicker-free.

Low Overhead Display Generator. Triple ranked input registers drastically reduce digital logic overhead time.

Fast Core. 750 nanosecond Display Processor Core permits more complex graphics and other applications programs to run concurrently with flicker-free displays.

Optional Programmable Function Generators. Character set and function generator speeds can be changed under program control.

Extended Worlds. 16-bit X and Y position registers allow display to "window" in any one of 64X by 64Y worlds. Edge violation flags can be used to eliminate computer overhead time for non-displayed areas. .

Extended Instruction Set. New load register instructions permits more sophisticated file management.

Software Compatibility. All previously developed IDIIOM software useable with IDIIOM/II.

Field Proven Reliability. All IDIIOM/II components have already been proven in users' environments.

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A. THE DISPLAY PROCESSOR (DP) is a high-speed general-purpose, digital unit for scientific and industrial applications. Its features include:

Fast Operation	750 nanosecond memory cycle.
Large Instruction Set	142 plus 8 optional instructions.
Word Length	16 bits.
Modular Core Memory	Expandable to 32,768 words in 4096 or 8192 word increments.
Read-Only Memory	Contains addressable core; 16-bit word length; provides a CPU cycle time of less than 550 nanoseconds.
Automatic Data Transfer	Direct memory access (DMA) facility provides automatic data transfers with rates to 274,000 words per second; priority memory access (PMA) for transfer rates to 1.3 million words per second.
Multiple Addressing	Direct, indirect, relative, preindexed and postindexed, immediate, extended, and indirect indexed.
Flexible I/O	64 devices can be placed on the I/O bus. The I/O system can easily be expanded to include features such as automatic block transfer, multilevel priority interrupt, and cycle-stealing data transfers.

The Display Processor contains the following elements:

Control Section. The computer control section generates the basic 9.0 MHz system clock that provides the timing and control signals for all computer operations. It directs the transfer of data between the registers and controls CPU operations. It also interprets instructions read from memory and provides the necessary gating logic for executing them. Information from the instruction (1) register is used to generate the timing and control signals.

Decode Section. The decoding section decodes the fields of the instruction word held in the I register to determine the control signal levels. These levels select the timing signals generated by the timing unit in the control section.

Arithmetic Unit. The arithmetic unit performs arithmetic operations and manipulates data. It contains the adder and gating circuits required for the arithmetic, logic, and shifting operations.

The arithmetic unit also controls the gating of words from the operational registers and the I/O bus to the C bus where they are distributed to the operations or memory registers.

Operations Registers. The operations registers are designated A, B, X, and P. The A, B, and X registers are directly accessible to the programmer. The P register is indirectly accessible through use of the jump-class instructions which modify the program sequence.

- a. A Register. This 16-bit register is the upper half of the accumulator and accumulates the results of logical and addition/subtraction operations, the most significant half of the double-length product in multiplication, and the remainder in division. The A register may also be used for I/O transfer under program control.

- b. B Register. This 16-bit register is the lower half of the accumulator and accumulates the least significant half of the double-length product in multiplication and the quotient in division. It may also be used for I/O transfers under program control and as a second hardware index register.
- c. X Register. This 16-bit register permits indexing of operand addresses without adding time to the execution of indexed instructions.
- d. P Register. This 15-bit register holds the address of the current instruction and is incremented before each new instruction is fetched. A full complement of instructions is available for conditional and unconditional modification of this register. The P register is also used in relative addressing.

Auxiliary Registers. The auxiliary registers are designated I, L, R, and D.

- a. I Register. This 16-bit instruction register receives each instruction from memory through the W bus and holds the instruction during its execution. Instructions can be loaded in the I register from the C bus via the control panel register entry switches. The control fields of the instruction word are routed to the decoding section to determine the required timing and control signals. The five least significant bits of the I register are transferred into a shift counter to shift-count-control the shift instructions.
- b. L Register. This 16-bit address register contains the address of the memory location currently being accessed during either a clear/write or read/restore cycle.

Decode Section. The decoding section decodes the fields of the instruction word held in the 1 register to determine the control signal levels. These levels select the timing signals generated by the timing unit in the control section.

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- b. B Register. This 16-bit register is the lower half of the accumulator and accumulates the least significant half of the double-length product in multiplication and the quotient in division. It may also be used for I/O transfers under program control and as a second hardware index register.
- c. X Register. This 16-bit register permits indexing of operand addresses without adding time to the execution of indexed instructions.
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- b. L Register. This 16-bit address register contains the address of the memory location currently being accessed during either a clear/write or read/restore cycle.

- c. R Register. This 16-bit buffer holds the operand from memory in arithmetic/logic instructions. The R register buffers the arithmetic unit from memory to permit interlace I/O operations on a memory-cycle-stealing basis.
- d. D Register. This 16-bit register stores I/O information from the E bus, W2 bus, and data switch logic.

Data Switch Section. The data switch section provides gating logic for operand data being read from or written into memory via I/O. CPU information does not pass through this section.

Register Entry Switches/Display Indicators. The register entry switches enter data and instructions, via the control panel, in the A, B, X, I, or P register. The display indicators display the contents of the A, B, X, I, or P register as selected on the control panel.

Shift and Rotate. The shift and rotate (S/R) circuit is a special data path to implement A and B register shift and rotate operations.

Internal Buses. The basic computer contains six buses designated as C, Y, W, L, Z, and I/O.

- a. C bus. This bus provides the data path and selection logic for routing data from the arithmetic unit to the DATA switch logic, the operations registers (A,B,X,and P), the auxiliary registers (I and L), register display, and memory.

- b. Y bus. This bus provides the data path from either (or any combination of) the A, B, X, or P register or I/O data via the DATA switch.
- c. W bus. The W bus consists of W1 and W2 buses that provide paths for data in and out of memory.
- d. L bus. The L bus is a unidirectional bus that provides address information from the L register to all memory modules.
- e. Z bus. The Z bus provides data paths to the arithmetic unit from the I and R registers and register entry switches.
- f. Input/Output bus. The I/O bus is a party-line, bidirectional bus. It permits programmed data transfers between peripheral devices and the computer. The I/O bus also permits plug-in expansion of all peripheral controllers. Part of the I/O bus is an E bus used for bidirectional data transfer.

If the computer contains the PMA option, an additional bus is present:

- g. PMA bus. This bus provides the path for priority access to memory.

Input/Output Control. The I/O control section provides I/O timing and control signals and the 16-bit D register for the direct memory access, interrupt, and programmed I/O functions.

Direct Memory Access. The direct memory access (DMA) circuit provides the computer with a trapping capability. The DMA trap function performs automatic data transfers between computer memory and peripheral controllers (e.g., TTY, paper tape, and magnetic tape controllers). It allows a peripheral device to request the transfer of a data word while temporarily halting the processing of the stored program. To implement the DMA trap function, the BIC must be installed

to generate the required trap-out and trap-in requests. To prevent several peripheral devices from requesting data transfers at the same time, the priority line determines the order of the request.

Priority Memory Access (PMA). The PMA provides a capability that allows an external device to have priority access to the memory. A PMA request from an external device preempts use of the memory from the CPU. Except for the power failure/restart option, a PMA request has the highest priority in the system. The PMA provides higher transfer rates than are possible with the DMA.

Interrupt. The interrupt capabilities of the computer allow certain internal computer options, on a priority basis, to request the computer to execute an instruction independent of the program in progress. The options that can be used in conjunction with the interrupt function are the power failure/restart (PF/R), a real-time clock (RTC), PIM, and memory protection (MP). The buffer interlace controller (BIC) uses the interrupt function to initially start a transfer of data blocks and to stop the transfer.

During the interrupt, the computer program is directed to the memory address specified by the interrupting device and executes the instruction at that location. The execution of any instruction other than an I/O command can be requested. Normally, the instruction is a Jump and Mark command that results in the processing of an I/O subroutine.

External devices, with the proper hardware, can also make use of the interrupt function.

Programmed I/O. The programmed I/O circuit provides E bus information and I/O control signals for program-controlled I/O bus and internal CPU operations.

Memory System. The memory system comprises the most flexible memory features of any digital processor in its class. It includes core memory with wrap-around addressing or core memory with a read-only memory excluding wrap-around addressing.

Core Memory. The memory is an expandable, random-access, 3-wire/3D, magnetic-core memory. It provides program and data storage for the 620/f computer. The basic package accommodates 4096 or 8192 16-bit words. The system is expandable to 32,768 words in 4096- or 8192-word increments.

Instruction words read from memory are transferred to the control section for execution. Words may be transferred, under program control, from memory to the arithmetic unit, to the operational registers, or to the I/O bus. Words can be transferred, under program control, to memory from the operations registers or the I/O bus.

Read-Only Memory. The read-only memory (ROM) provides a nonvolatile computer word storage. It is directly addressed by the CPU which accesses it in the same manner as the regular 3-wire/3D memory. The contents of the ROM are prewired at the factory to the user's specifications. From a system point of view, all ROMs are addressed above the regular memory. When operating from the ROM, the CPU cycle time is less than 550 nanoseconds.

I/O Devices. The Display Processor is equipped with a full duplex Model ASR33 Teletypewriter, with paper tape punch and reader, as the standard I/O device. Optional I/O devices include the ASR35 Teletypewriter, Electronic Alphanumeric Keyboard, High Speed Paper Tape System, Magnetic Tape, and other Mass Memory systems.

Address Register, First Rank (DCU current Word Address)

Address Register, Second Rank (DLU current Word Address)

Address Register, Third Rank (FGU current Word Address)

Function Keyboard Logic and Lamp Registers
Light Pen Switch Logic

All Jump Class Instruction Logic

(b) The Display Logic Unit (DLU) consists of the Digital Processor and the Display Logic.

(1) The Digital Processor handles all File Insert Instructions and Mode Commands. It also handles the transmission of Display Data Words from the Device Controller to the Display Logic. The following logic elements, in addition to the necessary transfer buses, are contained in the Digital Processor:

Display Register

Display Mode Register

Control Logic

Control Storage Register, Lower Rank

Mode Data Register, Lower Rank

(2) The Display Logic processes and prepares all Display Data Words for use by the Function Generator Unit. It puts the data into the final form required by the Function Generator as defined by the Control Storage, Display Mode, and Mode Data Register. In addition to the necessary transfer buses and the display control logic, it contains the following operational elements:

Index Register

Arithmetic Units

Position X Register, Lower Rank

Position Y Register, Lower Rank

Destination X Register, Lower Rank

Destination Y Register, Lower Rank

The Destination X Register is also used for storage of the Character and Circle Data.

The Display Logic Unit transfers all required display data as a single parallel transfer, to the Function Generator Unit.

(c) The Function Generator Unit (FGU) consists of the Function Processor and the Analog (Function) Generators.

(1) The Function Processor holds and presents to the Analog Generators all data required for the generation of the analog writing signals (deflection and intensity). It also contains the control logic for the set-up and positioning delays, the execute commands to the Analog Generators, the status sensing logic, and the synchronous (light pen and edge violation) interrupt handling logic. In addition to the control logic and bussing structure, it contains the following operational elements:

Position X Register, Upper Rank

Position Y Register, Upper Rank

Destination X Register, Upper Rank

Destination Y Register, Upper Rank

Control Storage Register, Upper Rank

Mode Data Register, Upper Rank

Vector Rate Register

Update X Register

Update Y Register

- (2) The Analog Generators consist of three hardware function generators: Vector, Character, and Circle. The necessary data is presented to them in digital form by the Function Processor. Two control signals, Execute and Busy, are used to control each generator. Positioning, as well as line drawing, is accomplished within the Vector Generator.

The outputs of the three generators are combined to provide three signals to the CRT Display Unit: X deflection (horizontal), Y deflection (vertical), and Intensity.

The CRISPLINE Character Generator writes the full set of ASCII characters (94 alphanumeric and punctuation characters, plus 32 graphic symbols for the control codes, plus blank and null). In order to provide blank, null, and delete, the commercial @ symbol is omitted. Characters consist of from one (1) to sixteen (16) strokes; only the required strokes are written, no unneeded time is used.

The Vector Generator draws either relative vectors (Delta X, Delta Y with respect to initial position) or absolute vectors (to X,Y). Positioning, which is a function of the Vector Generator, is also relative or absolute, under program control. Vector writing time is proportional to the length of the vector.

The Circle Generator draws a circle of the specified radius (up to 9 bits radius or a full screen diameter) with its center at the current X,Y position.

C. THE DISPLAY CONSOLE contains the CRT Display Unit, the Light Pen and the Function Keyboard.

- (1) The CRT Display Unit consists of the CRT itself, high speed X and Y deflection amplifiers, an Intensity amplifier, and the required power supplies. It is essentially a high speed electro-magnetic-deflection X-Y monitor.
- (2) The Light Pen provides display element identification via interrupts to the Display Processor. The Light Pen is logically part of the Function Processor. The Light Pen Switch is logically part of the Device Controller.
- (3) The thirty-two (32) key Function Keyboard, with its eight (8) bit coded overlay permits direct operator message transmission to the Display Processor via the interrupt facility.

2. IDIIOM/II DESIGN PHILOSOPHY

The designation of "intelligent" vs. "non-intelligent" is really a description of the tasks which can be allocated to the Display System. An "intelligent" Display System is defined as one which can, as a minimum, handle all of the following tasks without support from a central computer:

1. Generate a steady, non-flickering display.
2. Generate typical graphic elements, such as, characters, lines, circles, dots, etc.
3. Accommodate common display housekeeping tasks, such as, light pen tracking, alphanumeric keyboard message composition and editing, picture scaling, moving, rotation and copying.

IDIIOM/II was specifically designed to provide the user with a device capable of acting as an intelligent display. IDIIOM/II uses a common core memory which may be independently, and simultaneously, accessed by two processors. One of these processors is the Central Processing Unit of the Display Processor which is an integral part of the IDIIOM/II system. The other processor is a special purpose Display Generator. IDIIOM/II can be classed as an intelligent system because it accomplishes the three main tasks as follows:

- A. IDIIOM/II generates a steady non-flickering display as a result of its basic design features. The design philosophy was to provide a Display System whose operating speed is limited only by the Analog Function Generators and the CRT Display Writing rate. This, coupled with the high speed function generators and deflection system, results in the display of a maximum amount of data without flicker. The three elements of the Display Generator operate asynchronously to each other with full overlap capability. This means that, while the Function Generator Unit is

writing a display element, the Display Logic Unit can process multiple look-ahead words until the next display element is reached. While the FGU and DLU are processing data, the Device Control Unit can concurrently access and process, if required, (jump class instructions), data from memory on a look-ahead basis. The high speed memory access provided by the PMA contributes to the overall high data rate.

For typical display files, this triple rank look-ahead feature results in the memory access of the DCU and the processing in the DLU occurring during the writing time of the FGU, so that new display data is ready by the time the FGU finishes the current operation.

- B. IDIIOM/II generates typical graphic elements such as: characters, lines, circles, dots, etc., through the use of hardware function generators. IDIIOM/II contains hardware generators for character generation, vector generation, dot generation and circle generation. In addition, other hardware devices allow these basic graphic elements to be modified. Modification includes choice of line structure (any vector or circle can be solid, dotted, dashed, dot-dashed), choice of four intensity levels, choice of four character sizes, choice of two character orientations, steady or blinking images, etc. All of these functions are controlled by appropriate hardware devices in the IDIIOM/II system.
- C. IDIIOM/II accommodates common display housekeeping and other tasks by a combination of hardware and software. For example, light pen tracking is both a hardware and software function. Picture scaling and rotation are accomplished by software methods. Two methods of display

file subroutining, Jump Store and Jump Subpicture (push-pop list), coupled with multiple word register load instructions, which include immediate, extended, address relative, data relative, and multilevel indirect references, provide the tools for sophisticated data file management systems. The ability to use both absolute and relative positional addressing permits flexible image manipulation.

- D. IDIIOM/II provides a number of special features to aid the serious software systems designer. These include a 'universe' consisting of 4096 'worlds' (the display screen is one 'world'). Program controllable analog and digital scissoring permits the display of data outside the 'real world' if desired. Edge violation interrupts permit the bypassing of nondisplayed data, to save operating time. The use of relative positioning, in connection with these features, allows a large display area (64X by 64Y worlds) to be translated with respect to the display window for detailed examination.
- E. IMPORTANT CONSIDERATIONS. Development of special application software is often a critical factor in realizing the full benefit of an interactive display system. If the system is designed with a low degree of hardware capability for interaction, the programmer's task of providing a highly interactive program is greatly increased. IDIIOM/II was designed specifically to provide a programmer with the maximum degree of convenience, versatility and simplicity of organization in writing application software. IDIIOM/II is the only interactive display which affords all of these capabilities to the programmer:

- (1) Construction of display files is similar to computer programming. IDIOM/II utilizes subroutining, indirect jumping, etc. This built-in similarity makes the programmer's task easier.
- (2) Relative addressing permits relocation of files anywhere in memory.
- (3) The Index Register in the Display Generator permits the drawing of iterative display entities as well as allowing two special hardware functions: Repeat Point and Graph Mode drawing.
- (4) Direct access to all display registers provides flexibility in programming and debugging.
- (5) Efficient display commands and hardware function generation leave more memory space available to the programmer.

IDIIOM/II HARDWARE SPECIFICATIONS

SUMMARY

A. DISPLAY CONSOLE

CRT Display Unit

Cathode Ray Tube: 21" rectangular CRT with bonded safety face plate. Face plate is etched and glass incorporates a neutral density filter to enhance contrast. Normal phosphor is PT385. Other phosphors are available

Display Area: Nominally 13" square; may be manually adjusted to provide a 12" square main area with two 2" x 12" annotation areas (one on each side), available by disabling analog cut. Additional vertical display area also available by disabling analog cut.

Resolution: CRT spot size is 0.010" within the 13" square area, and typically 0.015" outside.

Phosphor Protect: Available as an option.

Deflection: Magnetic deflection.

Magnetic Deflection Channel Random Positioning Time:
10 USEC maximum within the 13" square area, proportional to distance moved.

Magnetic Deflection Channel Small Angle Positioning Time:
1.5 USEC maximum for an excursion less than 0.5".

Accuracy: $\pm 3\%$ of full scale. Can be improved to $\pm 2\%$ linearity with optional linearity correction circuit.

Jitter: Less than $\pm 0.01"$. Can be further improved by line locking (standard, programmable feature).

Repeatability: Better than ± 0.02 ".

Stability: $\pm 0.5\%$ of full scale, after 1/2 hour warm up over eight hour period.

Intensity Channel Bandwidth: DC to 15 MHz.

Multiple Displays

Up to six displays (with appropriate optional drivers), each with a different presentation, and each with Light Pen, Function Keyboard, and/or Alphanumeric Keyboard, can be controlled.

Light Pen: The light pen utilizes a highly sensitive and very fast photo multiplier coupled to the hand-held pen through a light weight, easily flexed, rugged plastic fiber optics light pipe. An adjustably positioned lens, together with a light source and separate fiber bundle provides an illuminated aiming circle that accurately defines the area on the screen to which the pen is sensitive.

Alphanumeric Keyboard: Full Duplex Teletype Model ASR33. Includes keyboard printer and 10 cps paper tape punch, reader, and controller. Other keyboards available.

Function Keyboard: The function keyboard has 32 keys and provides for coded overlays. Each key has a light that is under program control.

B. FUNCTION GENERATOR UNITCRISPLINE Character Generator

Type: CRISPLINE Character Generator. Stroke writing. Asynchronous. Up to 16 strokes/character. Character writing time depends on number of strokes.

Character Writing Time:

<u>Size</u>	<u>Time for Average (10 Stroke) Character*</u>	<u>Characters Per Line</u>	<u>Character Spacing In Raster Units</u>
0	5 USEC	128	8
1	8 USEC	73	14
2	12 USEC	48	21
3	16 USEC	36	28

126 displayable USASCII symbols standard (94 alphanumeric and punctuation characters, 32 graphic symbols for control codes, plus blank and null). Other character fonts are available either hard-wired (optional as a custom read-only-memory), or can be defined under program control (with an optional random access memory).

Vector Generator

Continuous line generation (proportional time vector generator).

Writing Time:**

	<u>Length, Percent of Full Screen</u>
28 USEC	100%
16 USEC	50%
10 USEC	25%
(and so on, down to:)	
6 USEC	8.33%

* Time includes character writing time, logic operating time, and character incremental spacing time for strung mode.

** Time includes vector generator writing time, logic operating time, and vector generator set-up time.

All vectors less than 8.33% of full screen will be drawn at a constant time of 6 USEC.

Exclusive of other possible display geometric distortions, deviation of a vector segment (a vector resulting from a single set of instructions) from the ideal line drawn between the designated end points will not be greater than 0.02" or $\pm 1/2\%$ of vector length (whichever is greater), except that the vector end points will be within ± 0.02 " of programmed end point. However, vector intensity turn-on/turn-off may vary by ± 2 raster units* of programmed value.

The variations in intensity of the vector throughout its length, or from vector to vector, will be no greater than 2 to 1.

Circle Generator

Type: Continuous line generation.

Writing Time: 100 USEC, any diameter circle up to full screen.

Intensity Compensation: Intensity compensated for circle diameter, resulting in substantially equal brightness for circles of any diameter.

Position Generator

Position registers are 16 bit X and 16 bit Y (including sign), thus allowing the system to maintain files of data that are off the normal 10 bit X by 10 bit Y defined screen. Analog cut or scissoring normally limits the displayed image to the 13" x 13" area but this may be disabled under program control to allow writing light pen menus, rotation, etc., on the perimeter of

* "Raster Unit" is smallest element of digitally addressability. With size controls set for 13" x 13" square, one raster unit is $\frac{13"}{1024}$.

the screen.

Point Generator

Intensification Time: 1.5 USEC.

Other Functions

Size Control: Four character sizes, under program control. Superscripting and subscripting easily programmed.

Intensity Control: Four intensities under program control. Long and short "Blank" also provided.

Blink Control: Any graphic element can be blinked under program control.

Line Structure: Four vector and circle line structures are available under program control: solid, dash, dot, dash-dot.

Character Rotate: Characters can be rotated 90° CCW and plotted vertically under program control.

C. DISPLAY PROCESSOR

Random access, non-volatile 16-bit core memory - 4096 words (750 nanosecond read-write cycle). Expandable to 32K.

D. DISPLAY GENERATOR

Display Logic Unit

To facilitate programming and subroutining, all display positioning may be either incremental or absolute. Display modes include short point, repeat point, long point, short vector, long vector, character, rotated character, circle and graph. See Figure 2 for detailed word organization.

Analog and digital scissoring normally limits display area. Under program control, this may be disabled to permit writing menus, etc., on perimeter of screen.

E. OTHER

Fully solid-state (predominantly integrated circuit) except for the CRT; built to best commercial standards. Modular chassis and plug-in circuit boards.

Operating Temperature: 32°F to 85°F ambient (0°C to 30°C).

Housing: Display Console/Display Processor Cabinet, approximately 30" x 30" x 60" high. Display Generator Cabinet, approximately 30" x 30" x 72" high.

Power Requirements: 115 Volts, 60 Hz (220 Volt and/or 50 Hz operation optionally available) 4.5 KW nominal.

Separation Between Displays and Function Generator: Up to 1000 feet without light pens and/or function keyboards, or up to 100 feet with light pens and/or function keyboards.

F. OPTIONS

Increased Core Memory, to 64K.

Special hardwired characters, or programmable characters.

Function generator time change, under program control.

Second customer specified speed up to 100 times slower than standard speeds.

Color Displays.

Data Tablet.

Track Ball/Joy Stick.

Hard Copy.

Analog and digital scissoring normally limits display area. Under program control, this may be disabled to permit writing menus, etc., on perimeter of screen.

E. OTHER

Fully solid-state (predominantly integrated circuit) except for the CRT; built to best commercial standards. Modular chassis and plug-in circuit boards.

Operating Temperature: 32°F to 85°F ambient (0°C to 30°C).

Housing: Display Console/Display Processor Cabinet, approximately 30" x 30" x 60" high. Display Generator Cabinet, approximately 30" x 30" x 72" high.

Power Requirements: 115 Volts, 60 Hz (220 Volt and/or 50 Hz operation optionally available) 4.5 KW nominal.

Separation Between Displays and Function Generator: Up to 1000 feet without light pens and/or function keyboards, or up to 100 feet with light pens and/or function keyboards.

F. OPTIONS

Increased Core Memory, to 64K.

Special hardwired characters, or programmable characters.

Function generator time change, under program control.

Second customer specified speed up to 100 times slower than standard speeds.

Color Displays.

Data Tablet.

Track Ball/Joy Stick.

Hard Copy.

Display Processor options including hardware bootstrap loader, extended instruction set with hardware multiply and divide, real time clock, power failure/restart, memory protect, and priority interrupts.

Mass Memory, including tape, disc, and high speed paper tape.

Large Screen Displays.

Host computer or communication line interfaces.

IDIIOM/II SYSTEM SOFTWARE

A comprehensive complete package of operational software is supplied with the IDIIOM/II system. This includes an operating system, symbolic assembler, FORTRAN compiler, library of mathematical subroutines, debugging package, modular maintenance diagnostic package, and a variety of graphic routines.

ASSEMBLERS

DAS is a two-pass assembler that assists in program preparation by allowing instructions, addresses, etc., to be specified in a straight forward and meaningful manner. The twenty pseudo-operations that aid the user in coding and debugging allow for label and instruction definition, location counter control, conditional assembly, assembler and subroutine control and list and punch controls, as well as a set of FORTRAN pseudo-ops to provide for FORTRAN compatible output so that assembler output may be used as FORTRAN Subroutines.

The mnemonic set is readable without compromising the programmers ability to utilize the full machine instruction set.

Extensive syntax checking is provided. Errors are listed during the first as well as the second pass.

IDAS Assembly System is a versatile program operable in the Programmable Memory Unit in either of two modes. For mixed code programs...i.e., a combination of display file codes and programmable memory unit codes...it operates as a pre-processor for the DAS assembler to screen and define all display codes. For display code only routines, it acts as a 2-pass assembler which defines and assembles display files converting mnemonics into binary code.

The error codes and pseudo-operations are designed to complement the DAS Assembler.

UTILITIES

AID is a collection of useful diagnostic and utility routines allowing the programmer to call upon a wide variety of functions to aid him in debugging and running his program. These functions include searching, correcting and printing of memory as well as the establishing of breakpoints. Included also is a comprehensive binary paper tape handler that is particularly useful in preserving, in assembler output format, programs modified on the computer. This capability provides virtual on-line program creating ability.

RAID permits the operator to display, modify and debug programs by viewing the octal contents of memory on the IDIOM/II CRT. He can rapidly "window" or search through the contents of memory to locate program and coding errors.

CORRECT allows the programmer to alter source level tapes by the teletype control.

FORTRAN IV

FORTRAN Compiler. The IDIOM/II system provides the high level language capabilities with its one pass FORTRAN compiler conforming with the proposed American Standards for FORTRAN IV as published by the American Standards Association. This compiler can operate with as little as a Model ASR33 Teletypewriter. However, if high performance peripherals are provided,

the FORTRAN compiler will produce faster compilation and execution.

FORTRAN Callable Graphic Subroutines, operable in as little as 8K of core, are provided to permit the FORTRAN programmer to build and modify a display file directly from the results of mathematical equations. Interactive functions of the IDIIOM, such as Light Pen detection, and keyboard interrupts, may be directly monitored by the FORTRAN program. This permits all graphic manipulations and results to be handled at the FORTRAN level thereby extending to FORTRAN the full facility of interactive graphics. FORTRAN statements are used to define display file areas, identify "elements" and "entities", start, stop, copy, select and to perform many other manipulations and modifications.

DIAGNOSTICS

The Diagnostic program package is designed to check instructions, memory, input/output devices and to isolate errors. It can be used in either the preventative or corrective mode of operation. In the preventative mode, the complete system is checked for operational readiness. If a malfunction exists, in most cases, the preventative mode will isolate the error. The corrective mode of operation is used when a malfunction is known to exist and the preventative mode does not decisively show the trouble. Proper application of these diagnostic routines can cut mean-time-to-repair to minutes. This modular package can easily be expanded to accommodate special system hardware tests.

The IDIIOM/II Display Generator can be "exercised" to check all data paths and instruction decoding. Typewritten diagnostic messages

which pinpoint any hardware failures are provided by this program. All console interrupts and keyboard lamps are checked. Alignment patterns provide the basis for analog adjustments.

EXTENDED SOFTWARE SUPPORT

The extended software support, requiring a minimum of 8K core plus external storage, includes an improved Assembler, an Operating System (Monitor) and a Relocating-Linking System Loader providing a uniform relocatable format object output. The package, called MOS, is presently available for use with magnetic tape or disk.

The Monitor consists of:

- (a) An input/output control system to process all input/output requests for any user program including those of the System Executive, the Assembler, FORTRAN IV Compiler, and system loader. The input/output control system provides for specification of hardware independent logical units. The execution of input/output for the I/O device specified in the request is via a subroutine referred to as an I/O driver.
- (b) A System Execution which inputs user commands and executes or turns control over to the requested program. Upon completion of its function, the loaded program turns control over to a resident bootstrap routine, which reloads and gives control back to the system executive.

- (c) The Operating System Loader which loads the relocatable binary output for object programs produced by the assembler or FORTRAN Compiler. The loader automatically performs all linkages between a main program, subprograms and systems subprograms.

The Modified Assembler provides a uniform relocatable format object output. The assembler's I/O is written such that it is compatible and under control of the Operating Systems Input/Output control system.

The FORTRAN Compiler's I/O and object output has similar modifications as those for the Assembler.

IDINT - IDI's RESIDENT INTERRUPT MONITOR

IDINT is a set of interrupt handling subroutines which provide the IDIOM programmer with a very effective, yet simple means of handling display interrupts. Operator interrupts include light pen detection, light pen switch make and break, and individual make and break for the function keys. Display file interrupts such as the File Interrupt command (INT), the Jump Subpicture (JSB), and Jump Return (JRN) are extended to permit up to eight distinct interrupts for each. Recursive subroutining for any number of nested levels using subroutine stacking (Push-Pop) techniques is provided.

The Cycle Timer interrupt may be used to regulate the frame time to any integral number of cycles, as well as provide a real time clock for functions such as light pen tracking. All interrupt handling functions may be dynamically redefined.

The modularity of the IDINT package minimizes the space and time restrictions normally of concern with monitors or operating systems. The package can be resident in its entirety (for example, in a fixed high core location) to be called on by any user programs, or it may be separated, with only those parts required by the user assembled with his program, to be manipulated or used at will.

Some of the Subroutines in the IDINT package perform the functions described below:

Initialize all interrupts.

Allow the user to individually or collectively turn on, turn off, and invert lamps on the function keyboard.

Push-Pop Interrupt routine.

Provides multiple cycle frame synchronization or free running operation.

Handle cycle timer interrupts.

Process Light Pen flag interrupts.

Process Light Pen switch interrupts.

Process function key interrupts allowing for both the make and break of 32 keys.

Selective interrupt enabling.

IDINT has been effectively coded and provides both system and application programmers the real time asynchronous interrupt handling necessary in interactive graphics programming.

SUBROUTINE LIBRARY/DISPLAY PROGRAMS

The subroutine library is well tested and provides a set of routines sufficient to handle basic programming needs. It includes binary to decimal, decimal to binary conversion routines, double precision arithmetic routines, sign transfer routines as well as the

usual logarithm, exponential and trigonometric functions for fixed and floating point arithmetic and for operating peripheral equipment. Conventions and instructions are provided so the user can add application programs to the library and have them called by DAS, FORTRAN with the ability to draw grids, edit text and track with the light pen.

GRID Subroutines

- (a) GLIN - Linear Graph.
- (b) GLOG - Log or Lin - Log Graph.
- (c) GPOL - Polar Graph.

The programmer specifies the upper and lower limited of the graphs in X and Y, and the number of divisions in each. In GPOL, the number of circles and radii are given. The subroutine builds the appropriate display file which can then be called by the master display file as a display file subroutine.

The TRAK Subroutine provides Light Pen tracking. Tracking may be made conditional on the pressing of the Light Pen switch. The tracking pattern is not dependent on the size of the Light Pen field of view, so the operator may adjust this, or "pull back" from the screen with no difficulty. A predictive tracking algorithm is used to provide tracking in excess of 60 inches per second.

TED is several text editing subroutines provided to permit flexible data entry and editing functions such as:

- (a) Advance Cursor.
- (b) Backspace Cursor.
- (c) Delete Character.
- (d) Replace Character.
- (e) Insert Character.
- (f) Carriage Return.
- (g) Line Feed.

OPTIONAL SOFTWARE

In addition to the software described above, which is included at no additional cost with the IDLIOM/II, IDI offers special application and communication software packages. These optional packages include such items as IDADS (Information Displays Automatic Drafting System), and IBM 2250 Emulator, and a package of three-dimensional rotation and perspective subroutines.

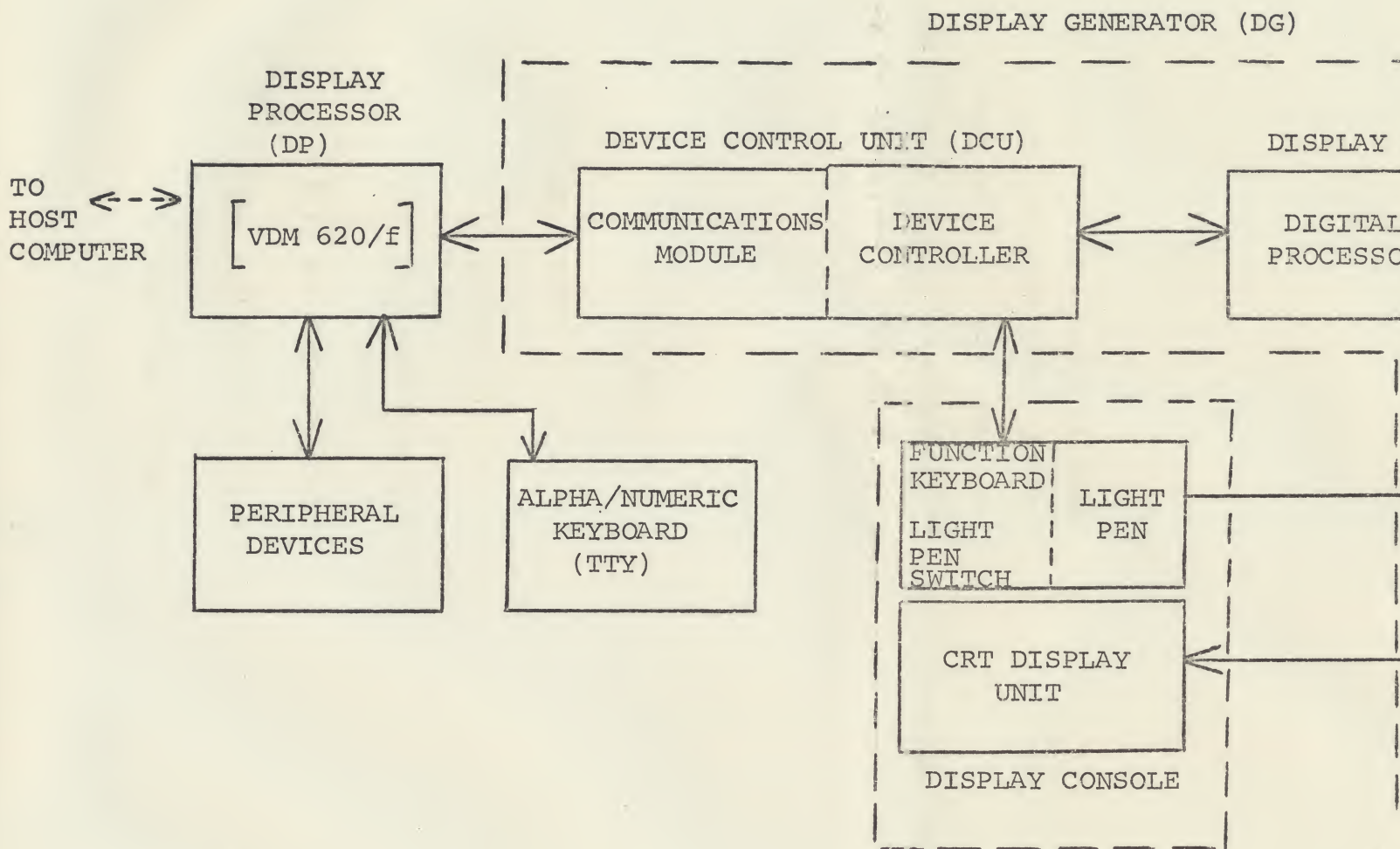


FIGURE 1

IDIOM/II

SIMPLIFIED BLOCK DIAGRAM

IDIOM 2 DISPLAY COMMA

MNEMONIC	DEFINITION	15	14	13	12	11	10
INT	Interrupt Word	1	1	1	1	0	0
JRN	Jump Return	1	1	1	1	0	0
JST	Jump and Store (1st word) (2nd word)	1	1	1	1	0	1
		IND					
SKP	Skip Next Word	1	1	1	1	0	0
		1	1	1	1	0	1
JUP	Jump (1st word) (2nd word)	IND					
		1	1	1	1	0	1
JSB	Jump Subpicture (1st word) (2nd word)	IND					
		1	1	1	1	0	1
PNX	Position X	1	0	0	0	REL	SG
PNY	Position Y	1	0	0	1	REL	SG
LDI	Load Index Register	1	0	1	0	REL	SG
SCR	Set Control Register	1	0	1	1	(S)	CY
SDS	Set Display Register	1	1	0	0	(S)	DS

DS	DISPLAY REGISTER	(EXCØ751)
CR	CONTROL REGISTER	(EXCØ55Ø)
DC	DISPLAY COMMAND REGISTER	(EXCØ45Ø)
I	INDEX REGISTER	(EXCØ25Ø)
Y	Y REGISTER	(EXCØ15Ø)
X	X REGISTER	(EXCØ5Ø)

ND LIST

09	08	07	06	05	04	03	02	01	00	OCTAL	TYPE
0	0	FRM	INI	SPI	(S)	SHG	AD2	AD1	AD0	1700000	Control
0	1	FRM	INI	SPI						1704000	
1	0	FRM	INI	SPI	REL	NDL				1730000	
		ADDRESS									Control
1	1									1714000	
0	0	FRM	INI	SPI	REL					1720000	
		ADDRESS									Control
0	1	FRM	INI	SPI	REL					1724000	
		ADDRESS									
N				OPERAND						1000000	File
N				OPERAND						1100000	
N				OPERAND						1200000	
T	(S)	LPN	(S)	WNK	(S)	BRT	(S)	LST		1300000	File
0	(S)	DS5	(S)	DS4	(S)	DS3	(S)	DS2	DS1	1400000	

RADIUS		Immediate	
5	0	1600000	Mode
DELTA X	DELTA X	174000	
SGN	DELTA Y	0000000	
SGN	DELTA Y	0100000	
SGN	DELTA Y	0200000	
SGN	DELTA Y	0300000	
DELTA X OR DELTA Y	DELTA Y	0400000	
DELTA X OR DELTA Y	DELTA Y	0500000	
DELTA X OR DELTA Y	DELTA Y	0600000	
DELTA X OR DELTA Y	DELTA Y	0700000	
1 0 OFS	SZ	175000	MODE
1 1 OFS	SZ	175400	MODE
CHARACTER 2		0000000	DATA
DELTA Y		174400	MODE
DELTA Y		0000000	DATA
REL		177000	FILE
1 1		177400	----
0 0 0	DC I Y X	1500000	FILE
DATA			
0 0 0	DC I Y X	154000	FILE
ADDRESS			

Edge Detect Enable

No Delay

Optional Velocity

Relative Address

Relative Data

Semi Hog Data Transfer

EDG

NDL

OPV

RAD

RDT

SHG

EXI

		15	14	13	12	11
INSTRUCTION	DEFINITION					
EXC 050	Select X Register					
EXC 150	Select Y Register					
EXC 250	Select Index Register					
EXC 350	Select Address Register	CH2				
EXC 450	Select Display Command Register		(S)		COLOR	
EXC 550	Select Control Register	(S)	MT2	MT1	MT0	(S)
EXC 650	Start Display & Enable Interrupts					
EXC 651	Enable Display Interrupts					
EXC 753	Disable Display Interrupts					
EXC 653	Reset the DPU					
EXC 750	Halt Display&Enable Interrupts					
EXC 751	Select Display Register	IN		FLG		F6
		OUT	15	14	13	12 (S)
EXC N52	Select Keyboard&Lamp Register N					
EXC 051	Select Keyboard Register		04		KBR	
EXC 151	Select Lamp Register Lower	15				
EXC 251	Select Lamp Register Upper	31				

10	09	08	07	06	05	04	03	02	01	00
----	----	----	----	----	----	----	----	----	----	----

DATA WORD CONTENTS										OCTAL INST	
OPERAND										100050	
OPERAND										100150	
OPERAND										100250	
OPERAND										100350	
ABS	MODE	OFS	(S)	EDG	(S)	OPV		SZ	100450		
CYT	(S)	LPN	(S)	WNK	(S)	BRT	(S)	LST	100550		
NONE										100650	
NONE										100651	
NONE										100753	
NONE										100653	
NONE										100750	
DS6	F5 (S)	DS5	F4 (S)	DS4	F3 (S)	DS3	F2 (S)	DS2	F1 (S)	DS1	100751
NONE										100N52	
00	KBM	LPM	OVERLAY							100051	
LOWER LAMPS									00	100151	
UPPER LAMPS									16	100251	

INPUT/OUTPUT INSTRUCTIONS

INSTRUCTION	DEFINITION	OCTAL INST
SEN 050	Sense Display Ready (Halted)	101050
INA 050	Input to A (OR)	102150
INB 050	Input to B (OR)	102250
IME 050	Input to Memory	102050
CIA 050	Input to Cleared A	102550
CIB 050	Input to Cleared B	102650
OAR 050	Output From A	103140
OBR 050	Output From B	103250
OME 050	Output from Memory	103050

INTERRUPT
RESET
INT
JRN
JSB
CYF
LPF
LPS
KBS
EDG

ABS Absolute (vs. Relative)
 BRT Brightness
 CH2 Character 2 (vs. Character 1) for Light Pen Signal
 CYT Cyclic Interrupt Enable
 DS6 Display Register 6
 F1-6 Indicates Interrupt occurred on Display 1-6
 FLG Flag
 KBM Keyboard Make (1) [vs. Break (0)]
 KBR Keyboard Register (Indicates key pressed 0-3 decimal)

IDIIOM DISPLAY

INTERRUPTS

DEFINITION	INTERRUPT ADDRESS	FLG			
		15	14	13	12
Reset Interrupt	20	0	0	0	0
Display Interrupt	22	0	0	1	0
Jump Return	24	0	1	0	0
Jump Subpicture	26	0	1	1	0
Cyclic Flag	30	1	0	0	0
Light Pen Flag	32	1	0	1	0
Light Pen Switch	34	1	1	0	0
Keyboard Switch	36	1	1	1	0
Edge Violation Flag	32	0	X	X	1
In To Out		0	0	1	1
Out To In		0	1	0	1
Out-In-Out		0	1	1	1

LPM Light Pen Switch Make (1) [vs. Break (0)]
 LPN Light Pen Enable
 LST Line Structure (0-Solid, 1=Dot, 2=Dash, 3=Dot-Dash)
 MT 0-2 Match (with AD) Bits 0-2
 OFS Off Screen
 (S) Set Related Bits
 SZ Size (for Characters)
 WNK Wink

I/O AND INTERRUPT

LRI - LOAD REGISTER IMMEDIATE. The Load Register Immediate Display Command Word is a multiple word instruction: the first word being the LRI word, with the lower bits 00 - 05 indicating the registers to be loaded with data; the second and succeeding words being the data to be loaded into the registers selected. The first data word will be loaded into the first register selected (from right-to-left). The second data word into the next register selected, etc. (Note: no interrupt will occur until the entire command and data word string has been executed).

LRE - LOAD REGISTER EXTENDED. The Load Register Extended Display Command Word is a multiple word instruction: the first word being the LRE word, with the lower bits 00 - 05 indicating the registers to be loaded with data; the second and succeeding words being the address of the data to be loaded into the registers selected. The first address is associated with the first register selected (from right-to-left). The second address word is associated with the next register, etc. (Note: no interrupt will occur until the entire command word, address, and data string has been executed).

RAD - RELATIVE ADDRESS. In the LRE Command, the Effective Address is the Operand, plus the Current Address, plus one. The addresses may be multiple level indirect. Only the first effective address, for each register, is relative.

RDT - RELATIVE DATA. The data, whether accessed by an LRI or an LRE command, if destined for the X, Y, or Index Registers, will be added to the current contents of the register, if this bit is '1'.

NDL - NO DELAY. This bit will allow the Jump and Store command to be executed immediately, even though previous display data words are still being processed. In normal programs this bit should be a '1'. For certain special program uses, it will be '0'.

EDG - EDGE DETECT. The Edge Detect is used to detect any and all real world boundary crossing violations. When bit 05 is enabled in the Display Command Register, a vector, point, or position crossing from out-to-in or in-to-out will cause an interrupt to occur (interrupt address 032₈.) A circle or vector crossing boundary twice will also cause an interrupt to occur (interrupt address 032₈). The flag bits for an Edge Detect will indicate the type of violation that occurred. The address register, as in a light pen hit, will be at P+2 where P is the word that causes the interrupt.

OPV - OPTIONAL VELOCITY. Optional Velocity is used to change the function generator writing speed and position settling time to a preselected, factory set value for special output devices.

Special Note: The Enter Mode Commands (LPM, GRM, CHM, and RCM) set only certain bits of the Command Register (00-01, 07-10). The Color Bits (optional), the OPV and EDG can be set or reset only by Programmed I/O or the LRI and LRE Commands.

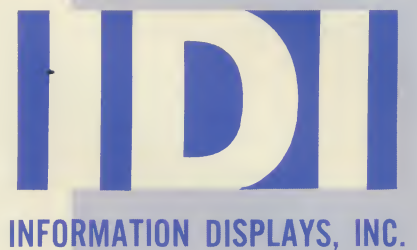
DESIGN NOTE

PROGRAMMING SPECIAL CHARACTERS FOR CRISPLINE CHARACTER GENERATOR

Characters are drawn with up to 16 inter-connecting lines, called strokes. The strokes may be visible or blanked. See figure 1 for stroke pattern of character B. All strokes must be numbered successively on the graph of figure 2 starting at the $X=\emptyset$, $Y=\emptyset$ reference point. The information for the assigned stroke number must be put in the proper columns (see example) on the data card. The last stroke of the character does not have to return to the initial start position.

The graph of figure 2 represents the overall area in which the character can be drawn. Normally characters are drawn in quadrant 1 with lower case characters written in a 5 by 7 matrix and capital characters in a 6 by 8 matrix. If necessary, characters may extend into the other three quadrants within the limits shown.

Each "box" on the graph represents one unit length in the X or Y axis. The allowable unit lengths which can be drawn in one stroke are either 1, 2, or 4 in either axis. A three unit length stroke is not permitted. Strokes may be drawn horizontally, vertically, or diagonally. If a horizontal stroke is desired, the Y information column for that stroke will contain a $\emptyset$ or no information. If a vertical stroke is desired, the X information column for that stroke will be $\emptyset$. A diagonal stroke may be drawn by assigning information to the X and Y columns for that stroke. The code for directing the length and direction of the strokes will be found on page two. A plus (+) sign preceding the unit



data
sheet
217-1170

INFORMATION DISPLAYS, INC. • 333 N. Bedford Road, Mount Kisco, New York 10549 • TEL: 914-241-1000
TWX: 710-571-2179

• Western Regional Office
15720 Ventura Blvd., Encino, California 91316 • TEL: 213-783-1560
TWX: 910-495-1749

• Southern Regional Office
3785 North East Expressway, Atlanta, Georgia 30340 • TEL: 404-458-0174

length will direct that stroke to the right (if in the X column) and upward (if in the Y column). A negative (-) sign preceding the unit length will direct that stroke to the left (if in the X column) and down (if in the Y column).

BLANKING

It may become necessary to "blank" strokes in the character. This is done by assigning special codes to that stroke. Only horizontal or vertical strokes can be blanked with the exception of a +4X, +4Y movement which is blanked by a special code.

CODES FOR BLANKING

To blank a horizontal stroke, assign the number one (1) to the Y information column for that stroke. To blank a vertical stroke, assign the number one (1) to the X information column for that stroke. To blank a diagonal (+4, +4Y) stroke, assign the number one (1) to the X information column and the number 0 to the Y information column for that stroke. To write a dot (no movement, but intensified) assign the number one (1) to the X and Y information columns for that stroke.

CHARACTER ADDRESS

Columns 16-18 must contain the character address. This is the number assigned to that particular character by the customer. The character address must be in octal code.

STROKE INFORMATION CODE

- 0 = No movement
- 1 = Blank other axis, no movement
- 2 = -1 unit length
- 3 = +1 unit length
- 4 = -2 unit lengths
- 5 = +2 unit lengths
- 6 = -4 unit lengths
- 7 = +4 unit lengths

DATA CARDS

Fill out the data cards as illustrated on the example page. If data cards are not available, list columns 1-80 with the information in the appropriate columns. Key punching must be IBM 029 compatible.

EXAMPLE PAGE
(CODING SHOWN FOR CHARACTER B)

COLUMNS 1-3 must be labeled SCO. SPECIAL CHARACTER ORDER

COLUMNS 8-14 Customer identification code
(COMPANY NAME)

• COLUMNS 16-18 Character Address (OCTAL CODE)

—COLUMNS 22-53 Stroke information, all even columns contain X information, all odd columns contain Y information.

```
STROKE 1 COLUMNS 22-23, 70= +4X, 0Y
STROKE 2 COLUMNS 24-25, 30= +1X, 0Y
STROKE 3 COLUMNS 26-27, 35= +1X,+2Y
STROKE 4 COLUMNS 28-29, 25= -1X,+2Y
STROKE 5 COLUMNS 30-31, 35= +1X,+2Y
STROKE 6 COLUMNS 32-33, 25= -1X,+2Y
STROKE 7 COLUMNS 34-35, 60= -4X, 0Y
STROKE 8 COLUMNS 36-37, 20= -1X, 0Y
STROKE 9 COLUMNS 38-39, 31= +1X, 0Y (BLANKED)
STROKE10 COLUMNS 40-41, 06= 0X,-4Y
STROKE11 COLUMNS 42-43, 06= 0X,-4Y
STROKE12 COLUMNS 44-45, 17= 0X,+4Y (BLANKED)
STROKE13 COLUMNS 46-47, 60= -4X, 0Y
STROKES 14-16 COLUMNS 48-53 00= NO DATA
      (END OF CHARACTER)
```

ALL UNUSED STROKES MUST CONTAIN A Ø IN BOTH DATA COLUMNS.

— COLUMNS 60-72
"COMMENTS"
[CHARACTER IS (B)]
└─ DO NOT
 FILL IN.

SCD		I.D.I.		102		70303525352560203105061760000000		B		--		403300																																																												
1	3	4	5	6	7	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

INFORMATION DISPLAYS INCORPORATED

[illegible]

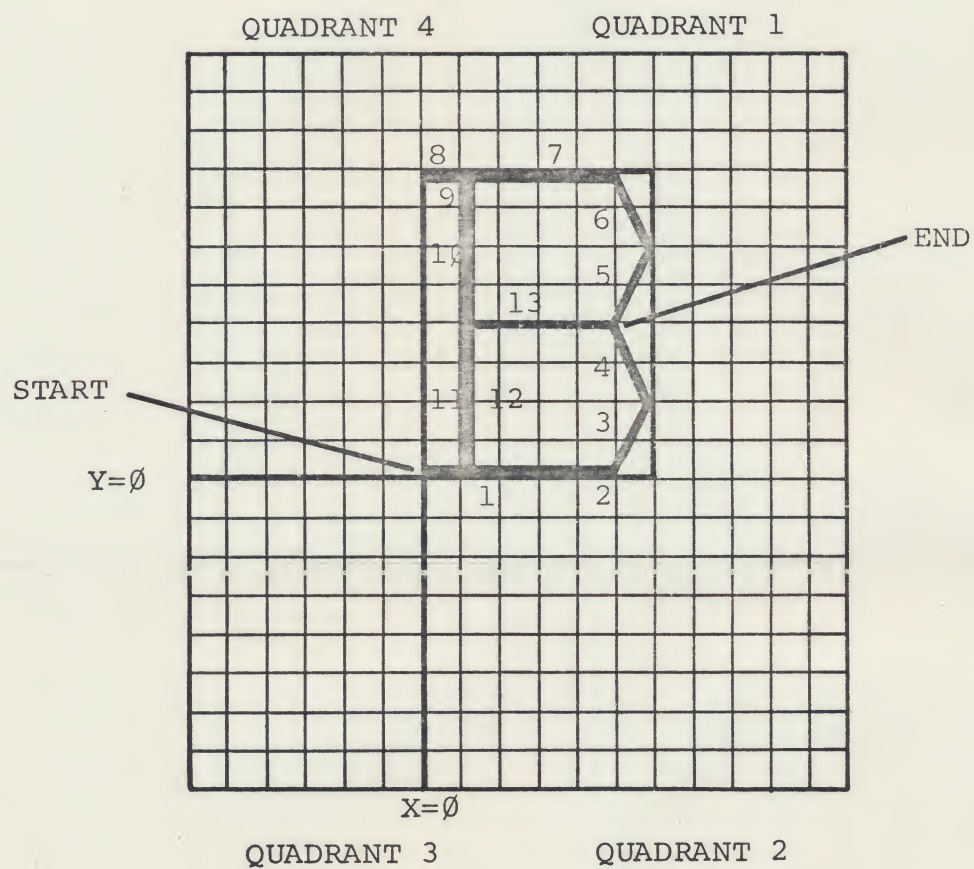


FIGURE 1. STROKE POSITIONS FOR CHARACTER B.

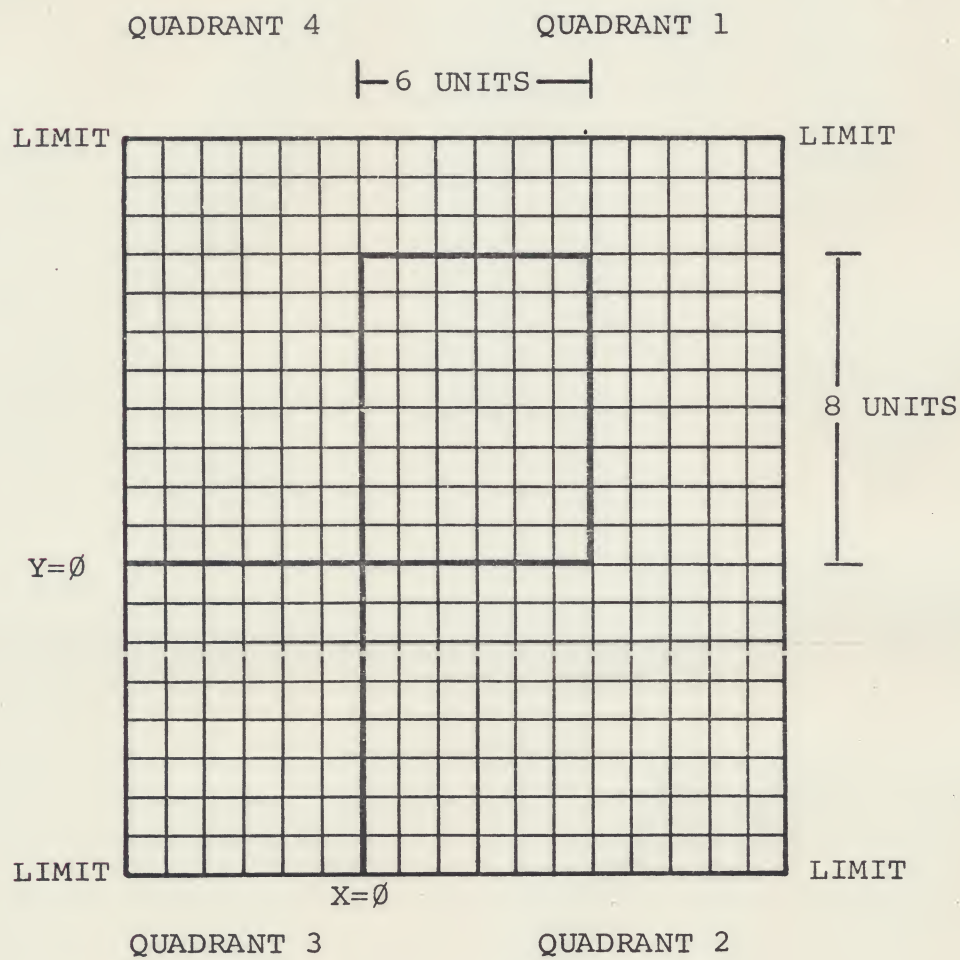
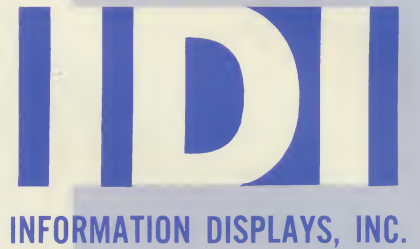


FIGURE 2. USABLE DRAWING AREA.

July 71

CRISPLINE CHARACTER GENERATOR
PROGRAMMABLE SYMBOL SET
TYPE 70-7030



DESCRIPTION:

The Type 70-7030 Programmable Character Set for the Crispline Character Generator makes provisions for 32 additional special characters or symbols. The 32 special characters are programmed under software control. The characters are customer specified in up to 16 strokes. Character writing time for each character including the special characters is an average 10 microseconds or less.

When used, the 32 special characters replace any specified set of 32 characters in the standard set of 128. The basic 128 characters is still available but a logic register is set to select the optional 32 special characters.

data
sheet

237-671

INFORMATION DISPLAYS, INC. • 333 N. Bedford Road, Mount Kisco, New York 10549 • TEL: 914-241-1000
TWX: 710-571-2179

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15720 Ventura Blvd., Encino, California 91316 • TEL: 213-783-1560
TWX: 910-495-1749

• Southern Regional Office
3785 North East Expressway, Atlanta, Georgia 30340 • TEL: 404-458-0174

USASCII CHARACTER VOCABULARY AND CODES
STANDARD SET

Character or Symbol	High Order Octal	Low Order Octal	Character or Symbol	High Order Octal	Low Order Octal
NULL*	400	100	SPACE	200	040
A	404	101	!	204	041
B	410	102	"	210	042
C	414	103	#	214	043
D	420	104	\$	220	044
E	424	105	%	224	045
F	430	106	& ampersand	230	046
G	434	107	' acute	234	047
H	440	110	(	240	050
I	444	111	)	244	051
J	450	112	*	250	052
K	454	113	+	254	053
L	460	114	, comma	260	054
M	464	115	- hyphen	264	055
N	470	116	. period	270	056
O	474	117	/	274	057
P	500	120	0	300	060
Q	504	121	1	304	061
R	510	122	2	310	062
S	514	123	3	314	063
T	520	124	4	320	064
U	524	125	5	324	065
V	530	126	6	330	066
W	534	127	7	334	067
X	540	130	8	340	070
Y	544	131	9	344	071
Z	550	132	: colon	350	072
[	554	133	; semicolon	354	073
\	560	134	<	360	074
]	564	135	=	364	075
^ circumflex	570	136	>	370	076
_ underline	574	137	?	374	077

*Standard Character vocabulary uses ASCII 7 bit Character Codes, except NULL replaces @. NULL may also be coded 000.

Information Displays, Inc.

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160-670

IDIOM/II PRICE LIST

Effective May 1971

1. Prices listed herein supersede all previously published prices for these items.
2. Prices and specifications subject to change without notice.
3. Prices: FOB, Mt. Kisco, New York. Any required packing or crating is extra.
4. We will be pleased to quote quantity prices for any item shown on this list.
5. Field installation of any feature may involve costs in addition to price listed below.

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
IDIOM SYSTEMS						
70-0010	IDIOM with 4096 x 16 programmable memory, 0.75 USEC cycle time, proportional vector generator, 128 symbol CRISPLINE character generator, circle generator, ASR33, 32 key function keyboard, 12 blank function keyboard overlays, light pen, size control (4), intensity control (4), line structure (4), blink, character rotate, 21" MONOFLEC CRT, extended positioning, two controller slots, multiplex color monitor capability, software, and manuals.	Note 2	\$ 66,700	\$ 2,335	\$ 1,905	\$ 500
70-0020	Same as 70-0010 but with 8192 x 16 programmable memory.	Note 2	69,200	2,425	1,975	520
70-0030	Same as 70-0010 but with 12,288 x 16 programmable memory, and additional 6 controller slots.	Note 2	74,300	2,605	2,120	560
70-0040	Same as 70-0010 but with 16,384 x 16 programmable memory, and additional 6 controller slots.	Note 2	76,900	2,695	2,195	580
70-0050	Same as 70-0010 but with 20,480 x 16 programmable memory, and additional 2 controller slots.	Note 2	80,400	2,815	2,295	605
70-0060	Same as 70-0010 but with 24,576 x 16 programmable memory, and additional 2 controller slots.	Note 2	83,000	2,905	2,365	625

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
70-0070	Same as 70-0010 but with 28,672 x 16 programmable memory, and additional 8 controller slots.	Note 2	\$ 86,600	\$ 3,035	\$ 2,470	\$ 650
70-0080	Same as 70-0010 but with 32,768 x 16 programmable memory, and additional 8 controller slots.	Note 2	89,100	3,120	2,540	670
70-0000	IDIOM/II same as 70-0010 but without programmable memory, ASR33, or controller slots.		54,450	1,910	1,555	410

INTERFACES

70-4020	UNIVAC 1108 Interface compatible or normal channel (16 bit).	Note 3	6,125	215	175	50
70-4021	UNIVAC 1108 Interface, addresses up to 3 IDIOM's on one normal or compatible channel (32 bit)	Note 3	12,250	430	350	95
70-4030	IBM System 360 (Model 30 or larger) Interface, SIOP or MIOP Burst Mode.	Note 3	12,250	430	350	95
70-4031	IBM System 360 (Model 30 or larger) and IBM Model 2250 compatible software.	Note 3	17,350	610	495	130
70-4043	HONEYWELL DDP-516 Interface, programmed I/O and DMC.	Note 3	6,125	215	175	50
70-4050	XDS SIGMA 2, 5, or 7 Interface, MIOP and SIOP (including communications software).	Note 3	12,250	430	350	95
70-4052	XDS SIGMA 3 Port (12 bit)	Note 3	12,250	430	350	95
70-4060	CDC 3200 Interface	Note 3	6,125	215	175	50
70-4065C	DATAPHONE* Interface, full duplex, 201A, 201B.	Note 3	1,090	105	75	15
70-4070	PDP-10, programmed I/O.	Note 3	12,250	430	350	95
70-4080	Buffered I/O Controller, general purpose interface.	Note 3	510	35	25	5
70-4081	Digital I/O Controller, 8 sense lines, 8 control pulses.	Note 3	410	15	15	5

*Registered Trademark

ADDITIONAL INTERFACES QUOTED ON REQUEST.

INPUT DEVICES

70-1010	Additional Function Keyboard (for Auxiliary CRT's), 32 keys and 12 blank overlays.	Note 4	2,975	105	85	25
70-1020	Additional Light Pen (for Auxiliary CRT's).	Note 5	1,450	55	45	10
70-1022	1000 cpm Card Reader and Controller.	Note 3	10,715	645	475	85
70-1025	300 cpm Card Reader and Controller.	Note 3	4,085	245	180	30

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
70-1051	300 cps Paper Tape Reader and Controller (including Bin and Manual Winder).	Note 3	\$ 2,460	\$ 145	\$ 105	\$ 20
70-1051A	150 cps Paper Tape Reader and Controller (including Bin and Manual Winder).	Note 3	1,695	100	720	15
70-1060	Electronic Alphanumeric Keyboard.	Note 4	2,050	75	60	15
70-1070	Trackball/Joystick, includes coincidence detector.	Note 4	4,100	145	120	30
70-1080	Graphic Tablet (10" x 10").	Note 3	10,250	615	455	80
70-1081	Graphic Tablet (20" x 20").	Note 3	27,350	1,645	1,205	205

OUTPUT DEVICES

70-2011	21" CRT Display Console (without Light Pen).	Note 5-70-7060	6,600	235	190	50
70-2012	21" Color CRT Display (without Light Pen).	Note 5-70-7060	13,650	480	390	105
70-2020	Precision CRT Display.	Note 5-70-7060	9,050	320	260	70
70-2026	200 cpm Card Punch & Controller.	Note 3	25,525	1,535	1,125	195
70-2026A	300 cpm Card Punch & Controller.	Note 3	28,075	1,685	1,240	210
70-2027	35 cpm Card Punch & Controller.	Note 3	6,700	405	295	55
70-2030	Paper Hard Copy Device.	Note 5-70-7060	25,550	895	730	195
70-2031	STATOS V (with character generator, software), 1024 styli.	Note 5-70-5020	28,450	1,710	1,255	215
70-2032	STATOS V (with character generator, software), 1400 styli.	Note 5-70-5020	32,100	1,930	1,415	240
70-2040	Microfilm Hard Copy Device.	Note 5-70-7060	20,500	720	585	155
70-2054	75 cps Paper Tape Punch and Controller (including Bin and Manual Winder).	Note 3	3,125	190	140	25
70-2077	Line Printer, 245 LPM, 132 column buffered.	Note 3-70-5020	17,450	1,050	770	130

INPUT/OUTPUT DEVICES

70-3006	ASR-33, Keyboard, Page Printer, 10 cps Paper Tape Punch/Reader, and Controller (included in all basic models, except 70-0000).	Note 2	No add'l charge	No add'l charge	No add'l charge	No add'l charge
70-3006D	Additional ASR-33 Keyboard and Controller.	Note 2-70-5009	2,050	125	95	15
70-3007	KSR-35, Keyboard, Page Printer (replaces ASR-33 normally supplied with all basic models, not available separately at this price).	Notes 2, 6	1,225	75	55	10
70-3007C	Additional KSR-35 Keyboard and Controller.	Notes 2, 6-70-5009	3,675	225	165	30
70-3008	ASR-35, Keyboard, Page Printer, 10 cps Paper Tape Punch/Reader (replaces ASR-33 normally supplied with all basic models, not available separately at this price).	Note 2	3,075	185	135	25

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
70-3008C	Additional ASR-35 Key board and Controller.	Note 2-70-5009	\$ 5,125	\$ 310	\$ 230	\$ 40
70-3055	Paper Tape System, includes time share controller, 150 cps reader, and 75 cps punch.	Note 3	4,100	250	185	35
70-3055A	Paper Tape System, includes time share controller, 300 cps reader, and 75 cps punch.	Note 3	4,800	290	215	40

MEMORY ADDITIONS

70-6010	Expansion Chassis I, up to 8K words memory, 6 controller slots, Power Supply.		1,535	95	70	15
70-6011	Expansion Chassis II, up to 16K words memory, 2 Controller Slots, Power Supply.		1,535	95	70	15
70-6012	Expansion Chassis III, 24 Controller Slots, Power Supply.		2,050	125	90	20
70-6020	4K words Read/Write Core Memory.	70-6010 or 70-6011	4,600	280	205	35
70-6021	8K words Read/Write Core Memory.	70-6010 or 70-6011	7,150	430	315	55
70-6030	Magnetic Tape Unit and Controller, 9 track, 800 BPI, 25 ips, single density.	Note 3	10,125	610	450	80
70-6030	Magnetic Tape Unit Slave, 9 track, 800 BPI, 25 ips, single density.	Note 3 70-6030	5,715	345	255	45
70-6031	Magnetic Tape Unit and Controller, 7 track, 25 ips, dual density. (200/800 BPI) or (200/556 BPI) or (556/800 BPI).	Note 3	9,100	550	405	70
70-6310	Magnetic Tape Unit Slave, 7 track, dual density, 25 ips. (200/800 BPI) or (200/556 BPI) or (556/800 BPI).	Note 3-70-6031	5,310	320	235	40
70-6038A	Disc Memory and Controller, fixed head, average access time 17 ms, transfer rate 73.3 KHz words, capacity 30K words, 16 tracks.	Note 3-70-5020	6,950	420	305	55
70-6038B	Disc Memory and Controller, fixed head, average access time 17 ms, transfer rate 73.3 KHz words, capacity 61K words, 32 tracks.	Note 3-70-5020	7,775	470	345	60
70-6038C	Disc Memory and Controller, fixed head, average access time 17 ms, transfer rate 73.3 KHz words, capacity 123K words, 64 tracks.	Note 3-70-5020	10,250	615	455	80
70-6039	Disc Memory and Controller, moving head, control for up to two drives, average access on track 20 ms, transfer rate 42 KHz words, capacity 585K words, IBM 2315 disc.	Note 3-70-5020	10,125	610	450	80

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
70-6039A	Disc Slave, moving head, average access on track 20 ms, transfer rate 42 KHz words, capacity 585K words, IBM 2315 disc.	Note 3-70-6039	\$ 5,725	\$ 345	\$ 255	\$ 50
70-6040	Disc Memory and Controller, moving head, average access time on track 12.5 ms, transfer rate 80K words per second, capacity 3.625 million 8 bit bytes-4 slave. IBM 1316 disc pack.	Note 3-70-5020	20,000	1,200	880	150
70-6040A	Disc Slave, moving head, average access time on track 12.5 ms, transfer rate 80K words per second, capacity 3,625 million 8 bit bytes, IBM 1316 disc pack.	Note 3-70-6040	16,800	1,010	740	130
70-6037	Disc Memory and Controller, moving head control for up to four drives, average access on track 15 ms, transfer rate 90 KHz words, capacity 1.17 M words, IBM 1315 disc pack.	Note 3-70-5020	12,775	770	565	100
70-6037A	Disc Slave, moving head, average access time on track 15 ms, transfer rate 90 KHz words IBM 1315 disc pack.	Note 3-70-5020	6,125	370	270	50
70-6041	Disc Memory and Controller, moving head, average access time on track 12.5 ms, transfer rate 80K words per second, capacity 7.25 million 8 bit bytes-4 slave. IBM 1316 disc pack.	Note 3-70-5020	25,000	1,500	1,100	190
70-6041A	Disc Slave, moving head, average access time on track 12.5 ms, transfer rate 80K words per second, capacity 7.25 million 8 bit bytes. IBM 1316 disc pack.	Note 3-70-6041	19,850	1,195	875	150
70-6044	Drum Memory and Controller, average access time 8.7 ms, transfer rate 106K words per second, 16 tracks, capacity 30K words (16 bit).	Note 3-70-5020	11,275	680	500	85
70-6045	Drum Memory and Controller, average access time 8.7 ms, transfer rate 106K words per second, 32 tracks, capacity 61K words.	Note 3-70-5020	12,300	740	545	95
70-6046	Drum Memory and Controller, average access time 8.7 ms, transfer rate 106K words per second, 64 tracks, capacity 123K words.	Note 3-70-5020	13,325	800	590	100
70-6047	Drum Memory and Controller, average access time 8.7 ms, transfer rate 106K words per second, 128 tracks, capacity 246K words.	Note 3-70-5020	15,525	935	690	120

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
70-6048	Drum Memory and Controller, average access time 8.7 ms, transfer rate 106K words per second, 256 tracks, capacity 491K words.	Note 3-70-5020	\$ 23,475	\$ 1,410	\$ 1,040	\$ 180
70-6049	Drum Memory and Controller, average access time 8.7 ms, transfer rate 106K words per second, 512 tracks, capacity 983K words (16 bit).	Note 3-70-5020	31,125	1,870	1,370	235
70-6210	Linc Tape, 204K, 8-bit, bytes/reel, transfer rate 8400 bytes/second.	Note 3-70-5020	10,250	360	295	80

CPU ADDITIONS

70-5005	Memory Protect		1,250	75	55	10
70-5009	Teletype Buffer Board, drives up to 7 TTY Controllers.		515	35	25	5
70-5010	Optional Instruction Set includes Hardware Multiply/Divide and additional instructions.		1,535	55	45	15
70-5012	Priority Memory Access and Interrupt Logic (included in all basic models).		No add'l charge	No add'l charge	No add'l charge	No add'l charge
70-5013	Real Time Clock		515	35	25	5
70-5014	Power Failure/Restart		515	35	25	5
70-5015	Automatic Bootstrap Loader.		310	20	15	5
70-5016	Priority Interrupts, 8 Multilevel.		515	35	25	5
70-5020	Buffered Interface Controller.		655	25	20	5

DPU & DISPLAY ADDITIONS

70-7030	CRISPLINE Character Generator, programmable symbol set, provides 32 additional characters which can be programmed under software control.		2,560	90	75	20
70-7031	Programmable Time Change; provides for slower function generator timing arrangement under program control. Customer specified second speed at any one of 64 values slower than standard.		1,535	95	70	15
70-7046E	230 VRMS, 50 Hz ASR-33.	Note 2	160	10	10	5
70-7047D	230 VRMS, 50 Hz KSR-35.	Note 2	310	20	15	5
70-7048D	230 VRMS, 50 Hz ASR-35	Note 2	160	10	10	5
70-7050	230 VRMS, 50 Hz IDIOM Modification Kit.	Note 2	1,125	70	50	10
70-7060	Auxiliary CRT Controller and Output Module; includes intensity gating logic (one required for each additional CRT).		820	30	25	10
70-7090	Additional Overlay Sheets (each)		1	—	—	—

Type	Description	Prerequisite	Purchase Price	1 Yr. Lease (See Note 1)	2 Yr. Lease (See Note 1)	Maintenance (See Note 8)
70-8010	Additional Equipment Cabinet (panel mounting space).		\$ 1,850	\$ 65	\$ 55	\$ 15
70-8020	Optional Color Paint (chips furnished on request).		335	15	10	5
70-8030	Special Desk Top (dimensions furnished on request).		160	10	5	5
70-8040	Tape for 70-6210 (150 feet).		16	1	1	1

NOTES

1. Lease terms and conditions (including buy-back provisions) included in standard IDI lease agreements 186-870 (1 year) and 235-571 (2 years).
2. The IDIOM/II without electromechanical devices (such as teletypes, readers, punches, etc.), operates from 120 VRMS, 47-63 HZ. However, prices for electromechanical devices are for operation at 120 VRMS, 60 Hz. To operate an IDIOM with ASR-33 at 230 VRMS, 50 Hz requires Kit 70-7046E (\$160). To operate IDIOM with KSR-35 at 230 VRMS, 50 Hz, requires Kit 70-7047D (\$310). To operate IDIOM with ASR-35 at 230 VRMS, 50 Hz, requires Kit 70-7048D (\$160). Request prices to operate other electromechanical devices at 50 Hz. Additionally, to operate the IDIOM from 230 VRMS requires Kit 70-7050 (\$1125).
3. Until otherwise stated, prices do not include software. For some configurations, additional controller card space may be required, such as 70-6012, Expansion Chassis III, and/or an additional 70-8010 cabinet.
4. Prices do not include interconnecting cables. Cable prices can be determined from the following:
Between IDIOM/II and remote Function Keyboard:
\$300. + \$3.80/foot.
5. Price does not include cabling. Cable prices can be determined as follows:
\$310. + \$1.75/foot (includes provision for light pen).
6. Because the KSR-35 does not include any paper tape I/O it may be necessary to include another paper tape I/O device in the system.
7. Certain functions can be left out of any IDIOM/II system when initially ordered. Functions may be added after installation of system. Check with IDI representative for price and delivery.
8. Maintenance terms and conditions, based on minimum one year contract, included in standard IDI Maintenance Agreements 185-1170 (Lease) or 13-571-12M (Purchase).